

Amendment Under 37 C.F.R. §1.111
Application No. 10/718,653
Attorney Docket No. 032131

REMARKS

Claims 1-18 are pending. Claims 4-14 and 16-17 have been withdrawn from consideration. Claims 1 and 15 have been amended herein. Support for the amendments is set forth in the remarks below.

Applicants Response to the Claim Rejections under 35 U.S.C. §103:

Claims 1-3, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nagatomi et al. (JP 54124968 and the abstract) in view of either one of Inada et al. (JP 06104317 and the abstract) or Shoffner (U.S. Patent 3,749,621), Da Costa (U.S. Patent 3,040,489), either one of Tsunashima et al. (U.S. Patent 5,051,475) or Homma et al. (U.S. Patent 5,336,703), and optionally Pool (U.S. Patent 3,501,128). Claim 15 is rejected under 35 U.S.C. §103(a) as being unpatentable over Nagatomi et al., either one of Inada et al. or Shoffner, Da Costa, either one of Tsunashima et al. or Homma et al., and optionally Pool as applied to claims 1-3 above, and further, in view of the admitted prior art (Specification pages 1-3).

Specifically, page 7, section 6 of the Office Action maintains that the roller diameter and pressing force are known variables to effect a lamination process. Hence, the Office maintains one of skill in the art would adjust these variables to find the optimum range obvious. The action specifically notes that applicants have not shown unexpected results in regard to these parameters.

In response thereto, applicants have amended claims 1 and 15 to more distinctly claim the subject matter regarded as the invention. Specifically, applicants have included the features of

the present invention that only heat from the heat generating part laminates the film, the heat generating part is heated to about 200 °C, and about 5 seconds after the roller is pressed to an area of the principal surface of the semiconductor substrate the area returns to a temperature about equal to the area's temperature prior to contact with the roller. These features of the claimed methods are not taught or suggested by the cited references, nor would they be obvious in light of the combination of the references. Further, these aspects of applicants' invention do demonstrate unexpected results (as set forth in the specification and described below) which would not have been obvious to one of skill in the art in light of the combination of the cited references.

As set forth at page 20, line 6 to page 21, line 21 of applicants' specification, when the silicon semiconductor substrate is locally heated by a heat source at 200°C cracking does not occur. Fig. 6 indicates that when the entire semiconductor wafer is heated there is greater thermal expansion and displacement during lamination results. Contrary, as shown in FIG. 7, the temperature of the semiconductor substrate at a position away from a local heat source by a distance of 5 mm is 60°C, while the temperatures at positions away from the heat source by distances 10 mm and 15 mm are below 40°C, which indicates that there is less thermal stress due to thermal expansion. The specification also indicates that when the local heat source is separated away from the semiconductor substrate, the temperature of the semiconductor substrate returns to a normal temperature in about 5 seconds. Hence, using only the pressing roller as a source of heating reduces the influence of thermal expansion on the semiconductor substrate and

there is no generation of cracking of the semiconductor substrate. As specifically stated in the specification:

Although cracking in the semiconductor substrate was expected when the temperature of the semiconductor substrate exceeded 60°C, according to the graph of FIG. 7, an area of the semiconductor substrate in which the temperature rises up to 60°C is limited to an area within about 5 mm from the heat source (heater). Thus, an actually heated area is small and the semiconductor substrate is merely heated locally. Moreover, when the heat source is separated away from the semiconductor substrate, the temperature of the semiconductor substrate returns to a normal temperature in about 5 seconds....

That is, since the semiconductor substrate is locally heated by the pressing roller, the thermal expansion of the semiconductor substrate occurs locally. Thus, the thermal stress is relaxed by other portions of the semiconductor substrate, and there is no thermal stress which may cause cracking of the semiconductor substrate.

Based on this teaching of the specification, the present invention pursuant to amended claims 1 and 15 demonstrates the unexpected result of not cracking the wafer when using only a high temperature heat generating part to perform the lamination.

Applicants respectfully submit that there is no teaching or suggestion in the cited prior art which would lead the skilled artisan to adopt the claimed parameters. Contrary, applicants have discovered that by use of these parameters, cracking of the wafer and uneven lamination is effectively prevented.


In view of the aforementioned amendments and accompanying remarks, Applicants submit that the claims, as herein amended, are in condition for allowance. Applicants request such action at an early date.

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If the Examiner believes that this application is not now in condition for allowance, the Examiner is requested to contact Applicants' undersigned attorney to arrange for an interview to expedite the disposition of this case.

If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,
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